Reducing Sediment from Roads in Tahoe Through Interagency Partnerships

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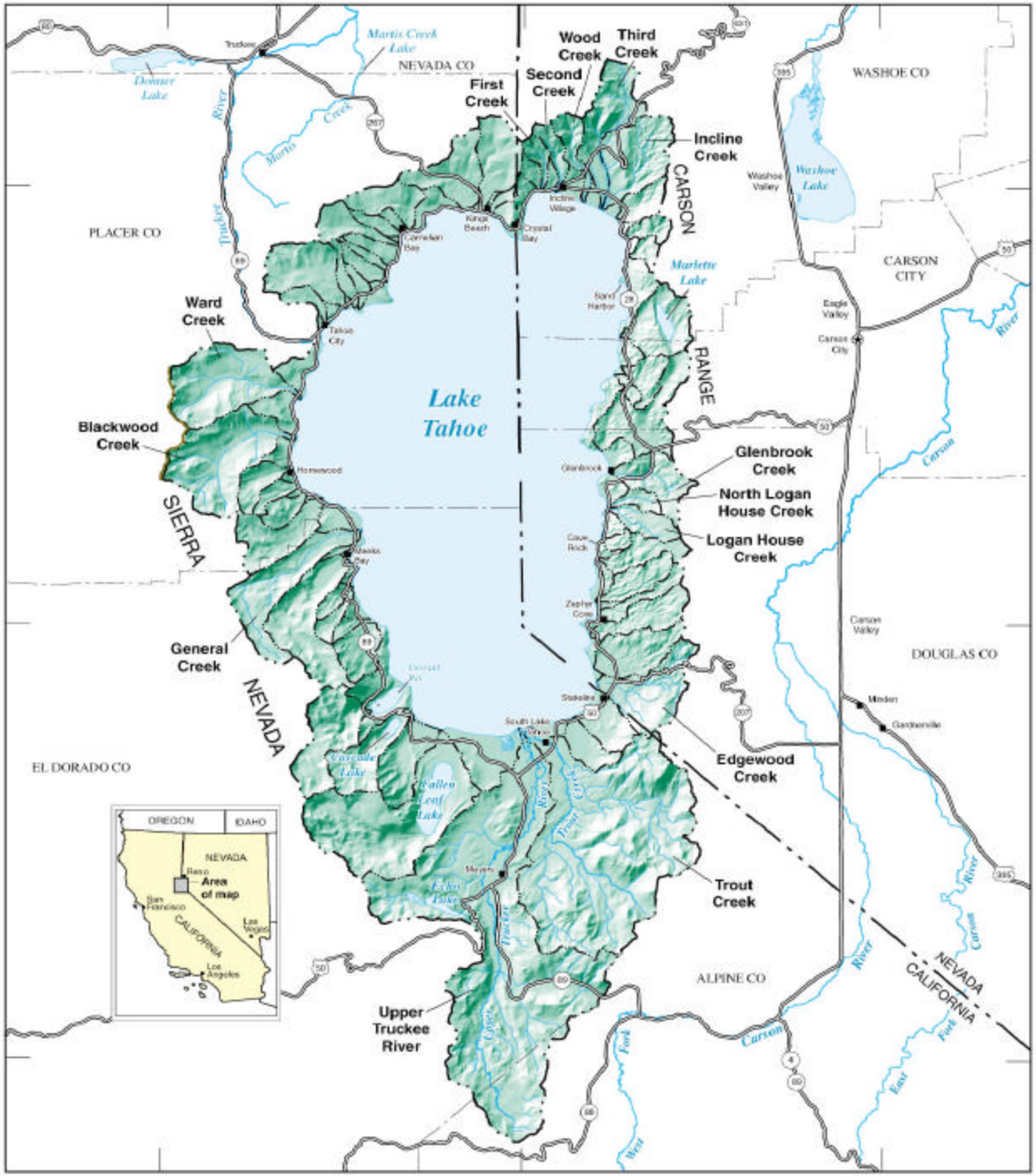

Lake Tahoe
Wood Creek
Third Creek
Second Creek
First Creek
Incline Creek
Ward Creek
Blackwood Creek
General Creek
Glenbrook Creek
North Logan House Creek
Logan House Creek
Edgewood Creek
Trout Creek
Upper Truckee River
Martis Creek Lake
Donner Lake
Marlette Lake
Washoe Lake
Tahoe City
Homewood
Glenbrook
Stateline
Meyers
Echo Lake
Fallen Leaf Lake
Carnelian Bay
Crystal Bay
Incline Village
Kings Beach
Sand Harbor
Zephyr Cove
Cave Rock
Carson City
Carson Valley
Minden
Gardnerville
Eagle Valley
Washoe Valley
PLACER CO
NEVADA CO
WASHOE CO
CARSON CITY
DOUGLAS CO
EL DORADO CO
ALPINE CO
SIERRA
NEVADA
CARSON
RANGE
OREGON
IDAHO
NEVADA
Reno
Area of map
San Francisco
CALIFORNIA
Los Angeles
Las Vegas
Truckee River
Martis Creek
Carson River
East Fork
West Fork
NEVADA
CALIFORNIA

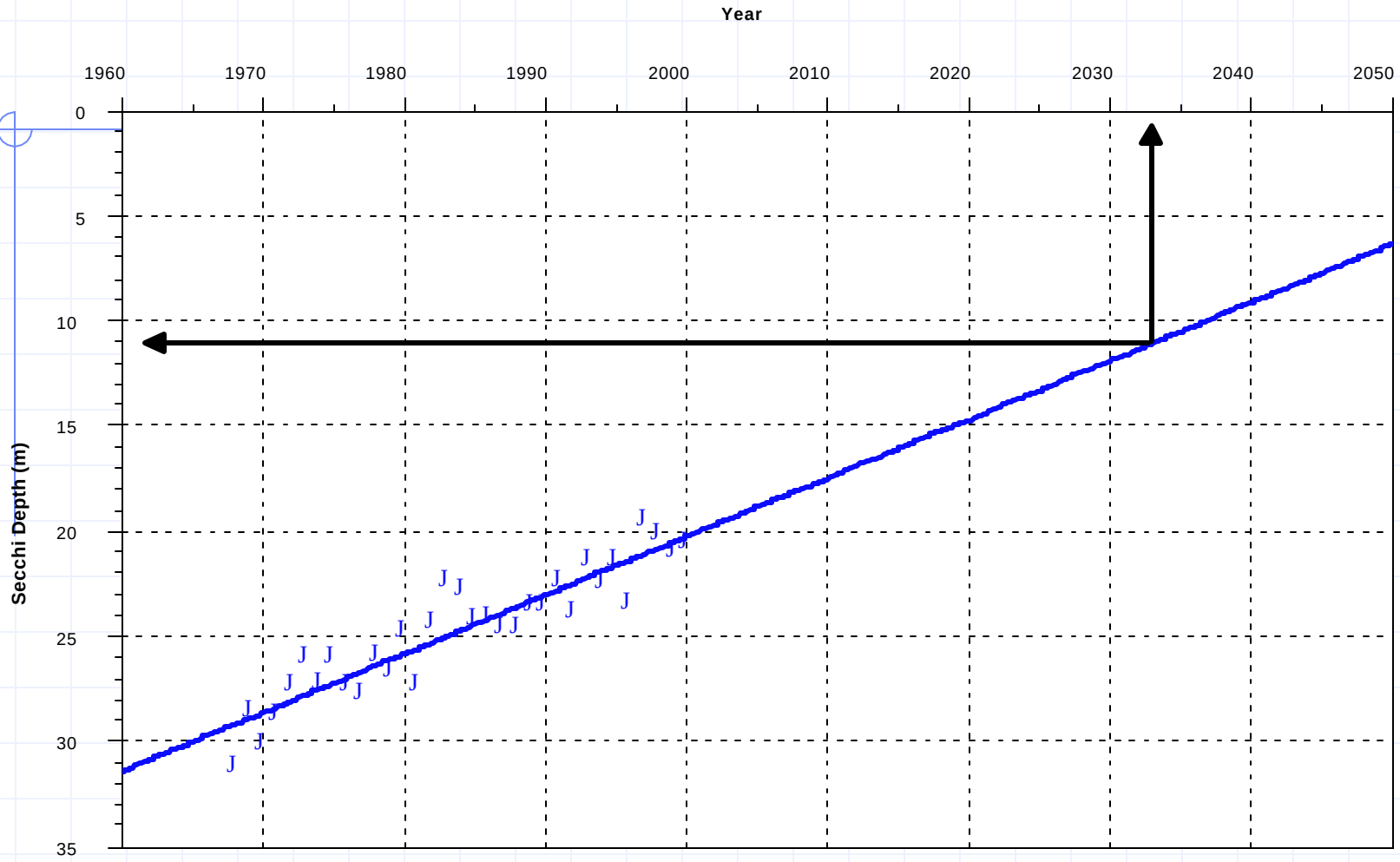
Why is Addressing Sediment from Roads an Important Issue?

- Historic cut and fill slopes present a significant sediment and nutrient source impacting the clarity of Lake Tahoe
- Management measures utilizing a source control approach are the best and most cost effective BMPs

Source: Lake Tahoe Watershed Assessment, 2000

Practice of Watershed Protection, Schuler

Lake Tahoe Clarity Trend

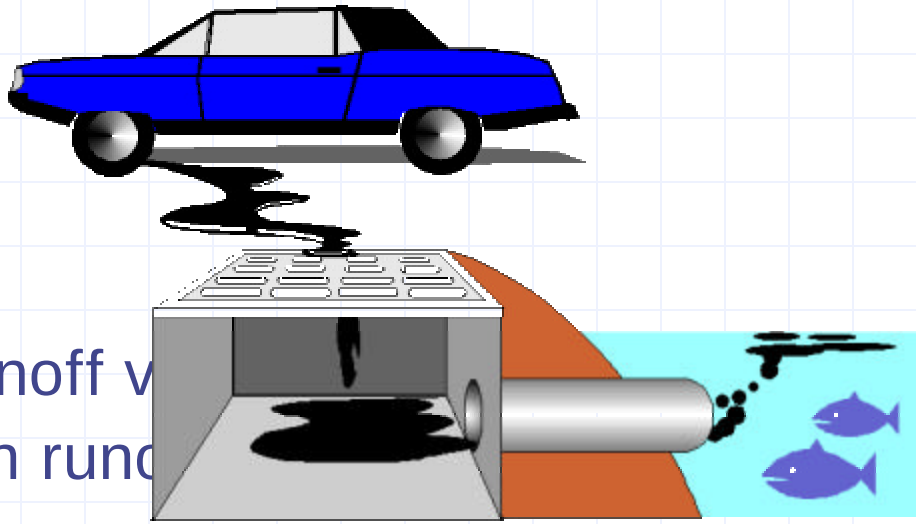


If present trends continue lake clarity will be reduced to an annual average of 11 meters within another 33 years. This is the length of time covered by the current TRG monitoring record (C.R. Goldman 1968 through 2000.)

Why is Urban Stormwater a Concern?

Typical Pollutants

- Suspended solids/sediments
- Nutrients (nitrogen & phosphorus)
- Metals (copper, zinc, lead, and cadmium)
- Oil & Grease
- Bacteria
- Pesticides & Herbicides
- Elevated Temperature
- In a comparison of urban runoff v
  untreated wastewater, urban runo
  was found to contain more heavy
  metals than untreated wastewater[1].



[1] Source: Dr. Sansalone, LSU, 2001

Nutrient Loading

INPUTS	Nitrogen	Phosphorus
Atmospheric	56%	27%
Stream Loading	20%	29%
Direct Runoff	10%	34%
Ground water	14%	9%
Shoreline Erosion	<1%	1%

Source: Lake Tahoe Water Quality Assessment, Vol. 1

Sources of Anthropogenic Constituents in Urban Pavement Runoff

	Brakes	Tires	Vehicle Frame & Body	Fuels & Oil	Exhaust	Concrete Pavement	Asphalt Pavement	De-Icing Salts	Litter
Cadmium	Secondary	Primary							
Chromium		Primary							
Copper	Primary								
Iron		Primary	Primary						Primary
Lead	Secondary	Secondary		Secondary				Secondary	
Nickel		Primary							
Zinc	Primary	Primary	Primary						
Chlorides								Primary	
Organic Solids							Primary		Primary
Inorganic Solids			Secondary			Secondary	Primary		Primary
PAHs				Secondary	Primary		Primary		
Phenols							Primary		
Mercury					Primary				

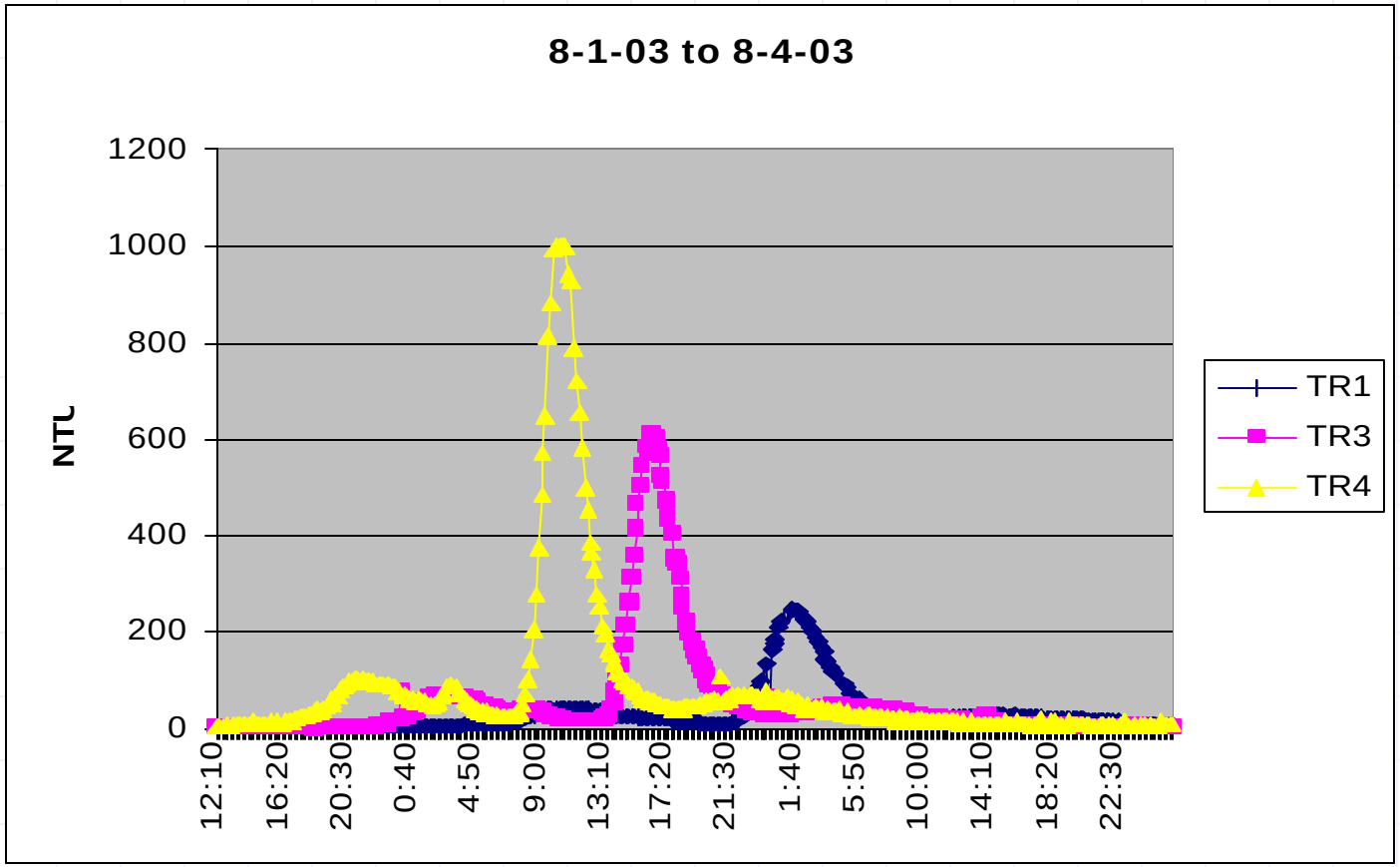
Legend: Secondary Source Primary Source

Lake Clarity and Sediment

- Fine sediment loading critical to lake clarity
- Latest information indicates fine particles having largest impact (perhaps 60% of clarity loss)
- TMDL and other research to link sources of impact to Lake clarity
- Need to apply new information to existing erosion control practices (fine sediment & P removal)

Upper Truckee River, Elks Club Bridge, August 2, 2003

Upper Truckee River, Meyers to Hwy 50 South Lake Tahoe



Stormwater Runoff

- Urban Settings – Generally more disturbed areas with more impervious coverage
- Rural Settings –More natural and undisturbed areas with little or no impervious cover
- Tend to see more runoff and sediment plumes before areas are treated then after EIP projects – Overall Good Performance

Who We Are,

What We Do, and Why . . .

- State regional planning agency created by the Tahoe Regional Planning Compact (adopted in 1969; amended in 1980) NRS 227.200

- "Leading the cooperative effort to preserve, restore, and enhance the unique natural and human environment of the Lake Tahoe Region."

Environmental Improvement Program

- Aimed at repairing environmental damage of the past
- Coordinated effort to identify, fund and implement all necessary environmental improvements, programs, and research to attain thresholds
- $908 million needed between 1997 and 2007. $1.4 billion over 20 years
- Develop basin-wide real-time management program (TIIMS)

Factors of Stormwater EIP Performance

- Design: Goal of design and condition or standards used in the design, rainfall intensity?
- Construction: Was construction according to design and appropriate to the site and design goals?
- Maintenance: Timely follow-up maintenance on 1) source control, and 2) water quality structures
- Operational Considerations: Runoff path treatment coordination and design

Why Embark on a Multi-agency Partnership?

- Given that the watershed of the Lake Tahoe Basin crosses the boundaries of two states and five counties, each with their own public works department/road department, a unified approach was sought...

CALTRANS	NDOT
City of So. Lake Tahoe	Washoe County Public Works
Placer County Public Works	Incline Village GID
El Dorado County DOT	Douglas County Engineering


...Because We Need
Erosion Control

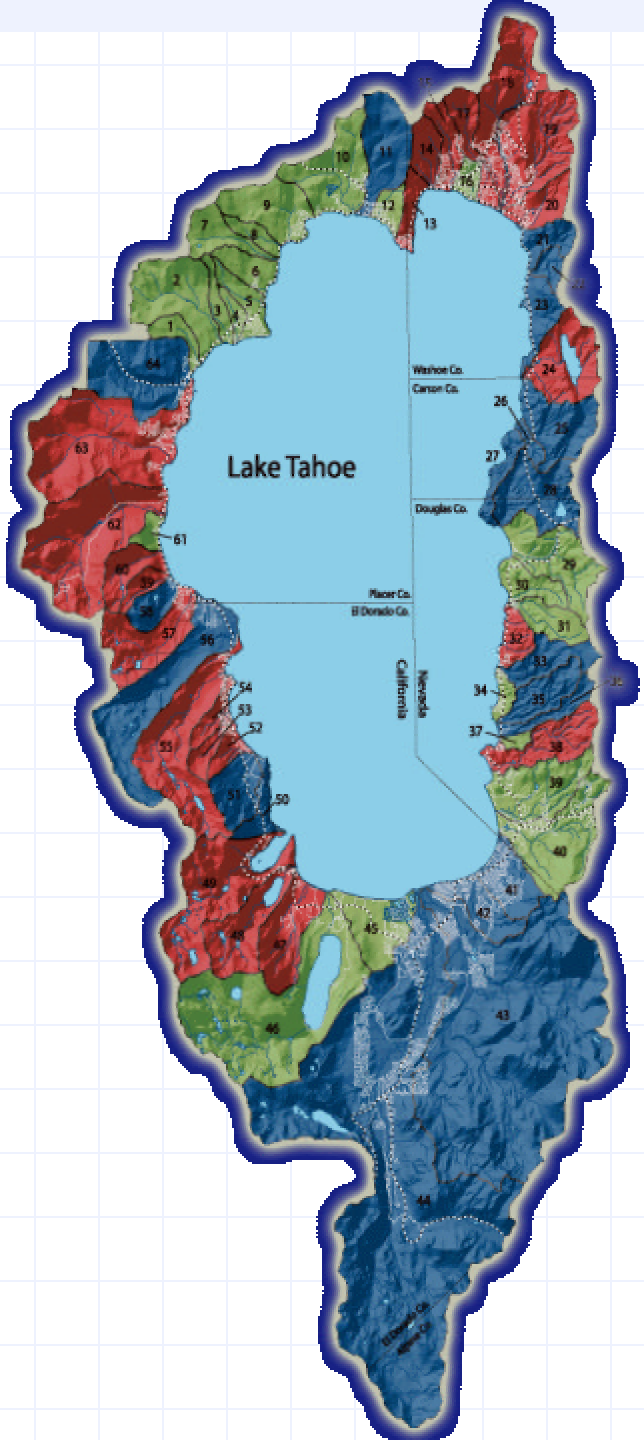
...Because We Need Water Quality Improvements

TRPA Priority Watersheds:

- 64 tributaries flow into Tahoe

- These tributaries are categorized into one of three priority groups

- Priorities are based upon nutrient & sediment yields, coverage in the watershed, stream flow…

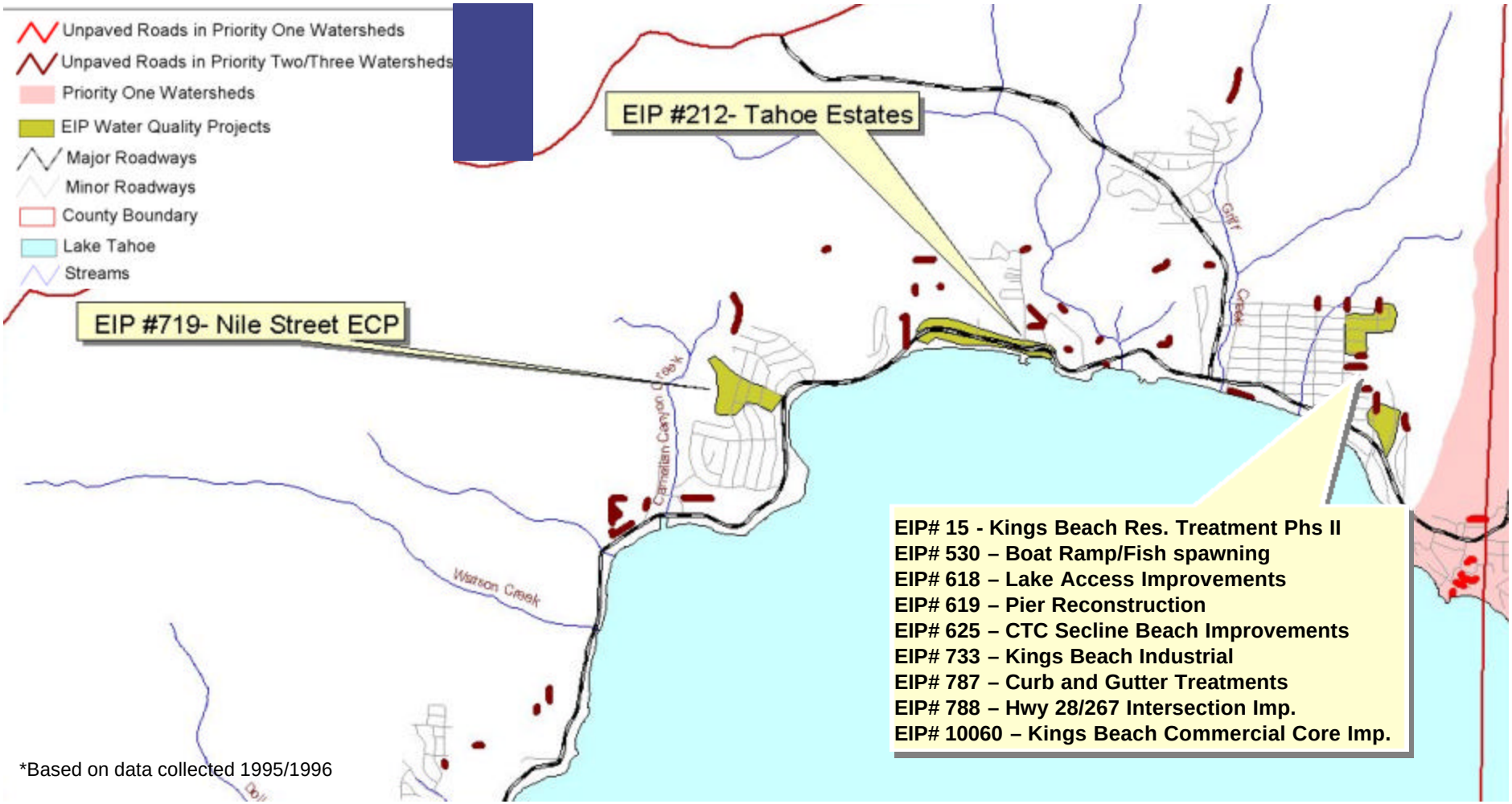


Unpaved County Roads by Priority Watershed

	Priority Watershed			
Jurisdiction	**One**	**Two**	**Three**	
Placer	**2.66 mi.**	**0.35 mi.**	**3.89 mi.**	**6.9 mi (67%)**
Douglas	0.03 mi.	0.04 mi.	0.99 mi.	1.06 mi (10%)
Washoe	1.39 mi.	0.26 mi.	0.31 mi.	1.96 mi. (19%)
El Dorado	0.09 mi.	0.26 mi.	0.0 mi.	0.35 mi. (4%)
Carson	N/A	N/A	N/A	N/A
Totals	**4.17 mi.**	**0.91 mi.**	**5.19 mi.**	**10.27 mi. (100%)**

Source: Capital Improvement Project Needs Data (1995)

Unpaved Roads & Corresponding Water Quality EIP Projects (North)



*Based on data collected 1995/1996

Planning & Design – Tahoe Style

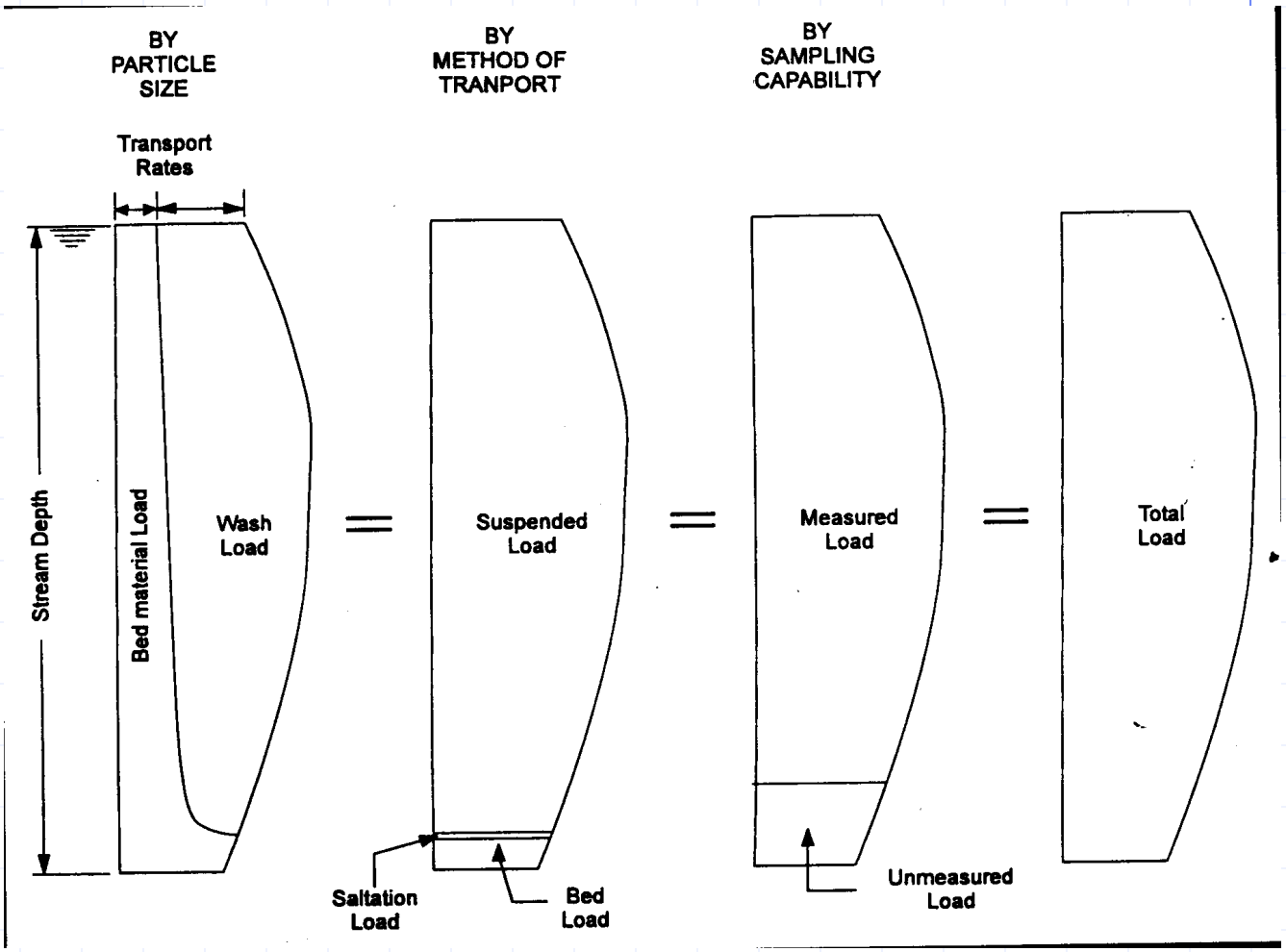
- Pre-design scoping meetings with design engineer in the field
- Submission of project plans at the 20% completion stage for comment/input
- Final design project plan submission

Basic Strategies for Reducing Sediment from Roads

- Site specific BMP solutions based upon:
  - Soil type
  - Vegetation
  - Upgradient conditions
  - Aspect
  - Slope
  - Scenic, Cost, dist. to H2O

Characteristics of Suspended Material

Travels as Bed Load, Saltation Load, Wash Load and Floatables

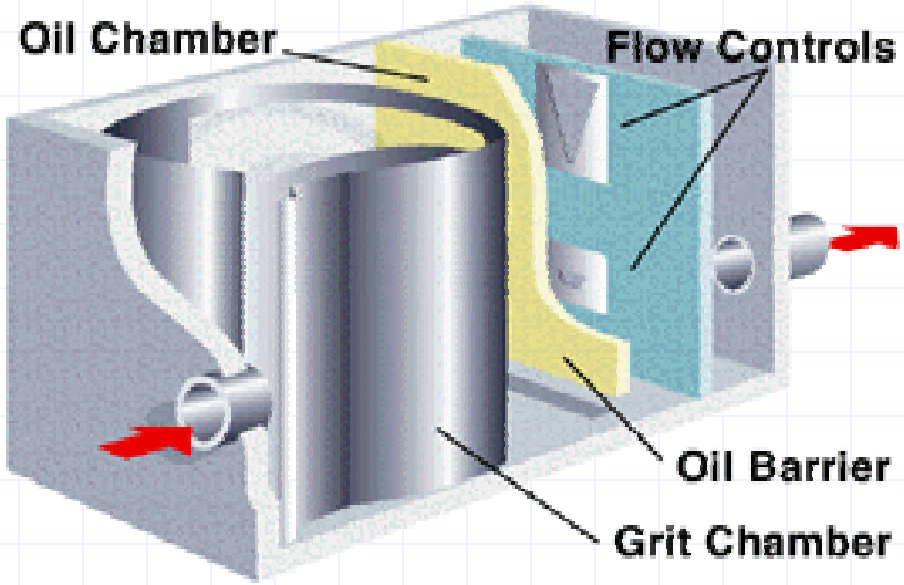


Origin of Material Suspended in Storm Water Runoff

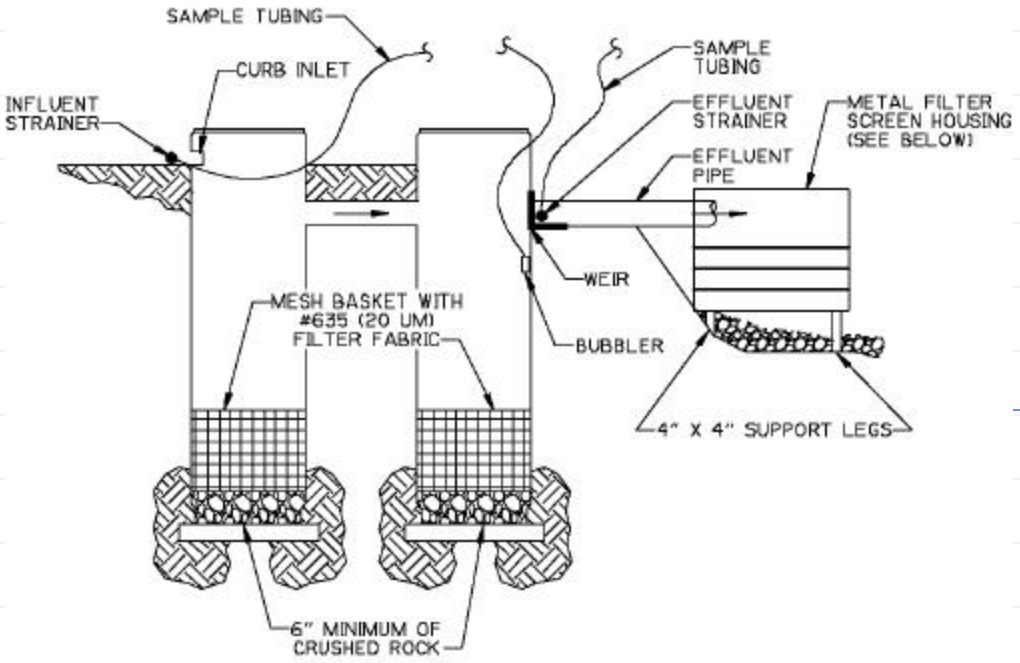
- Natural Soils and Atmospheric Dust
- Pavement Particles and Traction Sand
- Vehicle Rust Particles and Emissions, Tire Dust and Road Alligators
- Litter, Trash and Debris Including Plant and Leaf Material

Common Commercially Available Mechanical Pre-treatment BMPs used for Capturing Sediment from Roads

- Stormfilter
- Stormceptor
- Stormvault
- Vortechniques
- Bay Saver
- Downstream Defender



Caltrans Double Barreled Sand Traps Monitoring



- 2 years of the study have been completed
- 2 sites: Echo Summit & Tahoe Airport
- Minimum of 8 storms monitored per year
- Cost per year for monitoring each site $175,000

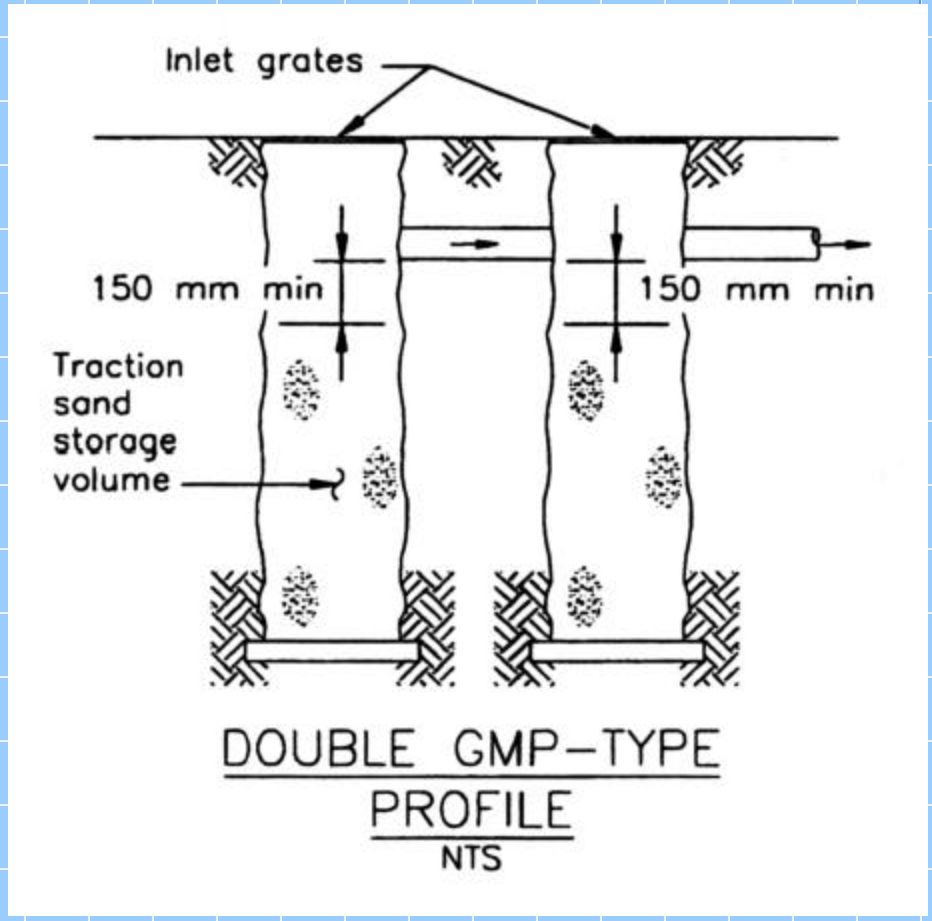
Double Barrel Vertical Sand Trap

Installation Cost: 500 @ $4000 ea. - $2.0 Million

Annual O & M Cost: $1050 per installation

Annual rehabilitation cost: Nominal

10-year O&M cost: $5.25 Million



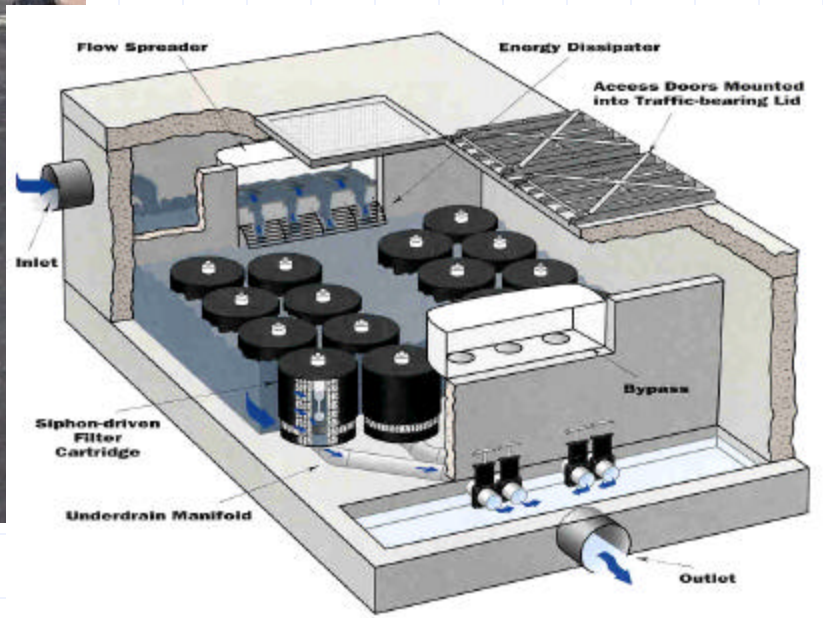
Removal Effectiveness

Constituent	Units	Average influent concentration	Average effluent concentration	% Removal
Total Suspended Solids	mg/L	553	384	31
Copper (total)	µg/L	36	28	20
Iron (total)	µg/L	12500	9900	21
Lead (total)	µg/L	26	20	24
Nickel (total)	µg/L	13	11	16

All other constituents tested did not show significant removal rates.

Installation of Oil/Water Separation Vault

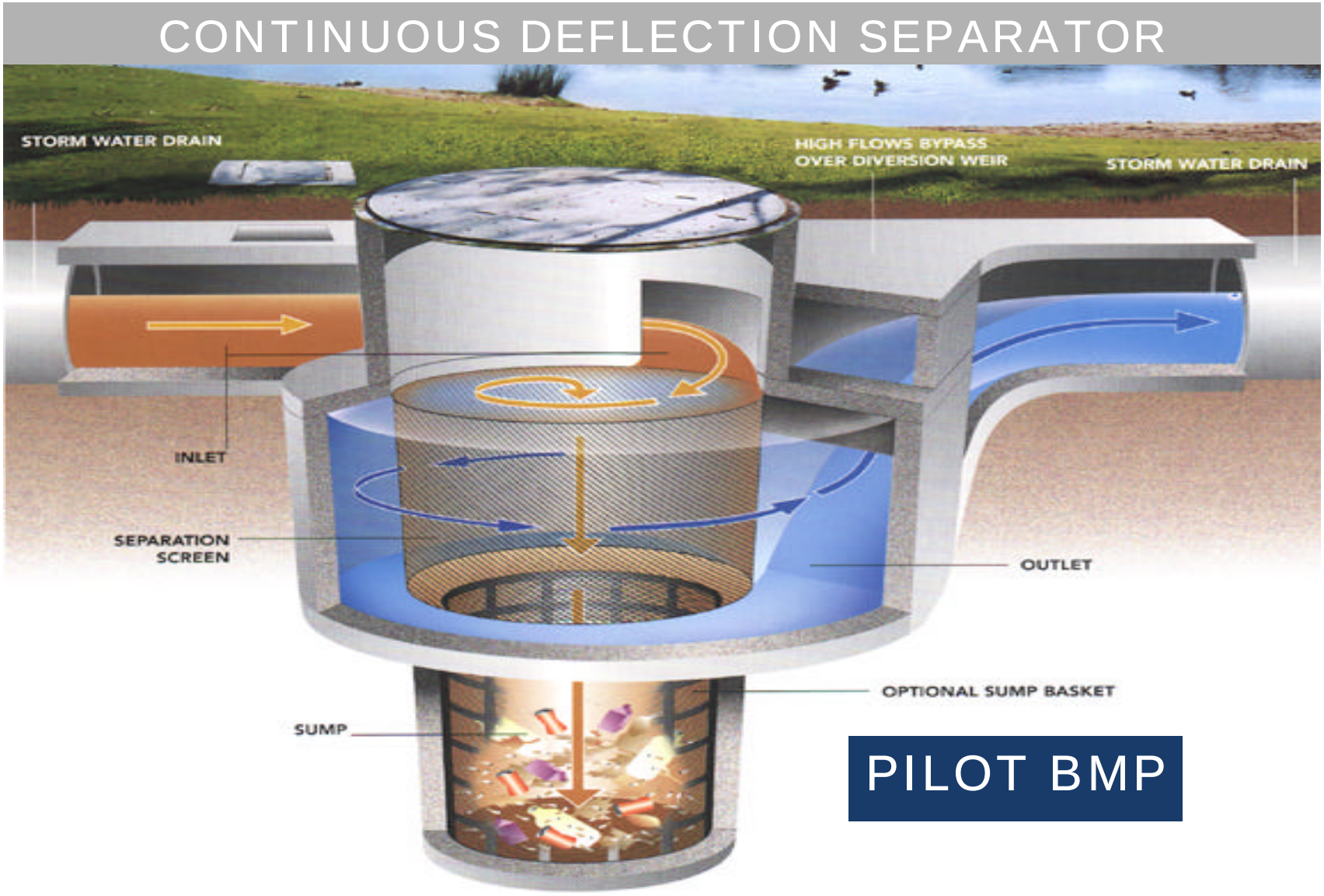
StormFilter™: Pearlite/Zeolite Canister



View of 16,000-gallon Vortechnics Treatment System

Stormceptor tm

MECHANICAL SEPARATOR



Detention/Retention Ponds for Capturing Sediment from Stormwater

Partnerships Do Work...

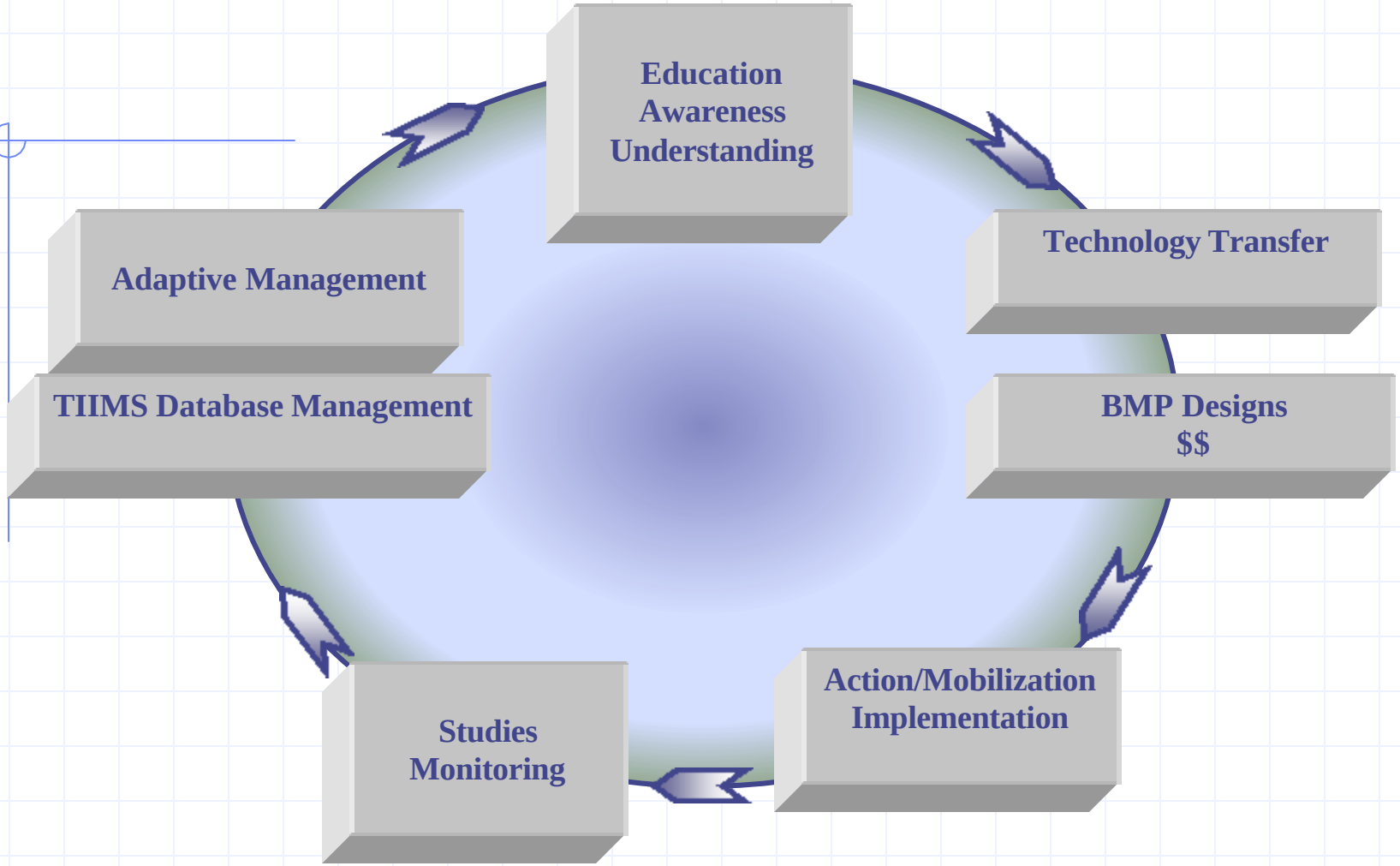
Project Funding:

-Ca Tahoe Conservancy

-TRPA

-CA Conservation Corps

Non-Point Source Progression



ADAPTIVE MANAGEMENT

- MOVE FORWARD WITH BEST AVAILABLE TECHNOLOGY
- PROVIDE TREATMENT TO THE MAXIMUM EXTENT PRACTICABLE
- MONITOR RESULTS
- SCIENCE & TECHNOLOGY WILL CONTINUE TO INTEGRATE & PROVIDE BETTER METHODS
- APPLY LESSONS-LEARNED

RECOVERING SAND FROM VERTICAL SAND TRAP WITH VACTOR TRUCK

Conclusions: Many BMPs are Effluent Quality Limited

- Percent removal is not an accurate measure of BMP efficiency
- Examine BMP efficiency in terms of probability that effluent concentration will exceed some criteria.
- (This can pose a dilemma for TMDLs with a pollutant reduction requirement)


Our Goal:
To Avoid This...


QUESTIONS
&
DISCUSSION